

DATASHEET

PNT Xe

Easy-to-use simulator extends
high-fidelity simulation to more
users in more project phases



Spirent PNT Xe

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Spirent PNT Xe

PNT Xe: PNT Test Precision Made Accessible

PNT Xe brings Spirent's trusted GNSS simulation performance to a wider range of users and applications, offering a cost-effective, compact solution without compromising on signal fidelity or reliability. Built on Spirent's proven signal generation architecture, PNT Xe supports multi-constellation, dual-frequency GNSS testing with the signal quality, stability, and repeatability needed in development and production workflows.

With its rack-mountable, lab- and field-ready form factor, PNT Xe is engineered for flexible deployment—supporting everything from functional testing during development to basic performance testing to production-line validation.

A novel guided-workflow interface simplifies scenario creation, shortens the learning curve, and minimizes risk of human error.

Testing with PNT Xe ensures full alignment with the same trusted Spirent standards used to design and verify the world's leading PNT systems—creating a seamless, consistent testing ecosystem.



Figure 1. PNT Xe simulation system

PNT Xe Signal Generator

The PNT Xe consists of a single 2U rack-mountable unit with internal controller running the Control Software. It supports one RF output and can be configured with up to two generic software-defined radio (SDR) cards generating up to 128 independent channels. All signals are combined and simultaneously routed to the front-panel primary RF output and rear-panel high-level output.

Each SDR card can be configured to generate up to 64 channels of any signal type within one of four frequency bands. Multiple constellations can be generated within a single SDR card, as long as they operate within the same frequency band.

PNT Xe also supports in-field upgrades, offering a clear path for future scalability, including:

- In-field hardware upgrade to add a second RF SDR card
- Software feature keys to enable additional GNSS constellations and signal capabilities

PNT Xe Control Software

The Control Software is ideal for essential testing, enabling users to perform fundamental verification tests. Spirent's precise constellation and navigation modeling is built in, delivering maximum ease of use. Simply set up a few key parameters and press 'run'.



Figure 2. Spirent PNT Xe Control Software

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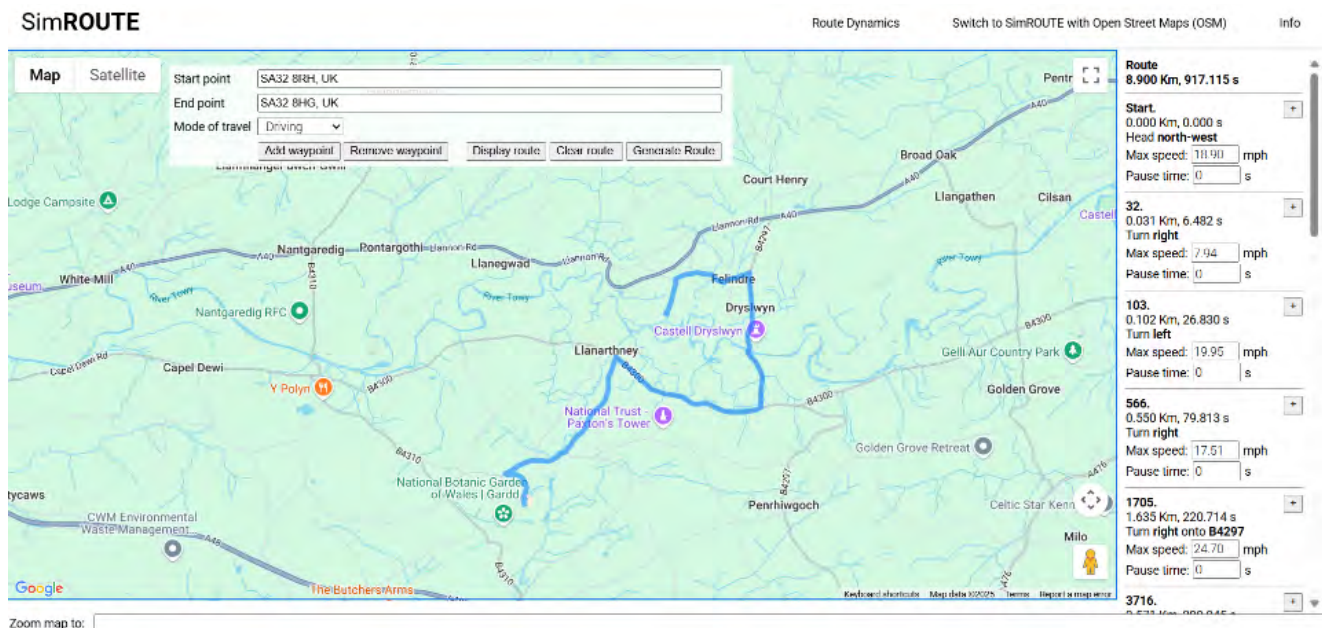


Figure 3. Spirent SimROUTE Google Maps User Motion Trajectory generation tool

Key features include:

- Edit and save time and date
- Enable/disable atmospheric modeling
- Enable/disable multipath
- Interactive power control of each individual constellation
- Load real constellation almanacs
- Choose static position, simple motion, “racetrack” motion, or Google Maps® matched trajectories via the Spirent SimROUTE™ tool
- Edit RX antenna level patterns
- Simulate leap second events
- Flexibly allocate available hardware channels across licensed constellations
- Display simulation parameters
- Display sky plot
- Selected remote control capability via Ethernet connection

Single Channel Utility (SCU)

PNT Xe supports the generation of a single channel satellite signal for each licensed constellation frequency. This allows individual control of several parameters including a satellite's carrier frequency, power level, velocity profile and PRN, secondary code, and navigation data.

Single Channel mode operation can be controlled via the GUI or remote commands. Remote commands are formatted according to Spirent's SimREMOTE™ ICD and are sent via TCP/IP. Single Channel mode operation is ideal for targeted testing scenarios where single satellite control is required.

GPS Authorized Testing

PNT Xe supports GPS authorized AES M-Code testing, which requires the SimMCODE option. US customers can purchase directly from Spirent Federal subject to approval by US authorities.

This option is available for authorized users only.

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Detailed Performance Specifications

GNSS Constellations and Supported Signals

Table 1. GNSS Signals Supported

System	Carrier	Signal	Message Type	Level ¹	Notes
GPS	L1	C/A	Legacy	-130.0 dBm	
		P	Legacy	-133.0 dBm	
		L1c Pilot code	CNAV-2	-128.25 dBm	
		L1c Data code	CNAV-2	-133.0 dBm	
		M Noise	-	-128.5dBm	AES-M requires SimMCODE
	L2	L2c or C/A	CNAV	-136.0 dBm	
		P	Legacy	-136.0 dBm	
		M Noise	-	-132.5dBm	AES-M requires SimMCODE
	L5	I, Q	CNAV	-127.9 dBm	
Galileo	E1	E1-B, E1-C (50/50 power sharing)	I/NAV	-128.0 dBm	OS Galileo Excludes SOL support
	E5ab	E5a(I+Q) and E5b(I+Q) (50/50 power sharing)	F/NAV, I/NAV	-122.0 dBm	OS Galileo – Supported FOC Galileo – Supported
	E6	E6-B, E6C (50/50 power sharing)	HAS	-128.0 dBm	
GLONASS	F1	C/A	Public	-131 dBm	
		P	-	-131 dBm	
	F2	C/A	Public	-137 dBm	
		P	-	-137 dBm	
	L1	CDMA	L1OC	-128.5 dBm	
	L2	CDMA	L2OCp	-128.5 dBm	
	L3	CDMA	L3OC	-128.5 dBm	

¹ Nominal power levels as defined by Spirent. Via the control software, the user can adjust nominal power levels to meet individual ICD conditions.

System	Carrier	Signal	Message Type	Level ¹	Notes
BeiDou	B1	B1I	D1, D2	-133 dBm	D2 does not include differential corrections or Iono grid
	B1	B1C	B-CNAV1	-130 dBm	
	B2	B2I	D1, D2	-133 dBm	
	B2	B2A	B-CNAV2	-127 dBm	
	B2	B2B	B-CNAV3, PPP-B2b_I	-130 dBm	
	B3	B3I	D1, D2	-133 dBm	
QZSS	L1	C/A, C/B	QZ-Legacy	-128.5 dBm	
		S	SLAS	-131 dBm	
		L1c Data + Pilot	QZ-CNAV-2	-127 dBm	
	L2	L2c	QZ-CNAV	-130 dBm	
	L5	I + Q	QZ-CNAV	-124.9 dBm	
		S		-127 dBm	
	L6	D+E	CLAS, CLAS-E (MADOCA)	-126.82 dBm ²	
IRNSS	L1	SPS	L1	-130 dBm	
	L5	SPS	L5	-130 dBm	
SBAS ³	L1	C/A	Data	-130 dBm	
	L5	L5-I	DFMC Data	-127.9 dBm	

² Default power level setting is for Block II satellites.

³ SBAS includes WAAS, EGNOS, MSAS, GAGAN, SDCM, KASS, ANGA, SouthPAN, and UKSBAS.

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System Performance

Table 2. Performance Levels for PNT Xe

Parameter	Description	Units	Notes
RF Signal Level	Carrier Level Control		
	Maximum	+15 dB	
	Minimum	-40 dB	4
	Resolution	0.1 dB	
	Linearity +15 dB to -30 dB	<0.10 dB	
	-30.1 dB to -40 dB	<0.20 dB	
	Absolute Accuracy	±0.5 dB	5
	Run to Run Repeatability	±0.1 dB	
Iteration Rates	Supported Simulation Iteration Rates (SIR)	10, 100Hz	
	Hardware update rate ⁶	100Hz	
	Bulk logging update rate	100Hz	
	Latency (remote data to RF)	4 x SIR	
Limit of Signal Dynamics ⁷	Relative Velocity	±20000 m/s	8
	Relative Acceleration	±1800 m/s ²	
	Relative Jerk	±15000 m/s ³	
	Angular Rates (at 1.5m lever arm)	>2 π rad/s	
	(indicative) (at 0.05m lever arm)	>10 π rad/s	
Signal Accuracy	Pseudorange Accuracy	5 mm RMS	9
	Pseudorange Bias	0 mm RMS	10
	1PPS to RF Alignment	< ±2ns	11
	Inter Frequency Alignment	< ±250ps (±75mm)	12
Spectral Purity	Harmonics	< -40dBc	

⁴ The control range extends to -50dB, but performance is unspecified below -40dB. Operation below -20dB is primarily to support antenna pattern and multipath functionality.

⁵ At 21oC ±5oC, +15 to -30dB. ±1.5dB 3-sigma all conditions.

⁶ The maximum rate at which any value can change is limited by SIR.

⁷ Note that the signal dynamic limits are dependent on the SIR and HUR.

⁸ For 6DOF data externally supplied via SimREMOTE or from a data file.

⁹ Digitization-induced error for signal acceleration < 45m/s², jerk < 50m/s³, 100Hz SIR.

¹⁰ Per carrier operating on a single SDR card. When the same signal is generated across SDR cards, the inter radio card bias uncertainty is ±250ps (±75mm).

¹¹ Between any RF carrier.

¹² PRN code alignment between frequency band.

Parameter	Description	Units	Notes
	In-band Spurious (highest limit applies)	< -182dBW	13
	Phase Noise (single sideband)	<0.02 Rad RMS	14
Signal Stability	Internal 10.00MHz OCX Oscillator (after warm up)	$\pm 5 \times 10^{-10}$ per day	
Static Multipath Channels	Fixed path-length delay per path	0 to 1245m	
	Resolution (approx.)	2.4m	
Scenario Duration	The maximum duration of a single scenario	24 days	
Latency	For operating in a HIL environment, the commands will take 4 times the SIR to be effective at RF.	40ms @ 100Hz	15

¹³ In-band spurious bandwidths (relative to center frequency unless otherwise stated):

GPS: L1 ± 20.5 MHz , L2 ± 20.5 MHz , L5 ± 20.5 MHz

Galileo: E1 ± 20 MHz , E5a ± 25.5 MHz , E5b ± 25.5 MHz

GLONASS: (relative to channel frequency 0) L1 ± 20 MHz , L2 ± 20 MHz

BeiDou: B1/B2 ± 20.5 MHz

¹⁴ Value is typical, integrated over a 1Hz to 10kHz bandwidth.

¹⁵ Simulation running at 10ms SIR.

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Extensions and Options

SimHIL

Spirent SimHIL enables integration of PNT Xe with third-party vehicle models and driving simulators for hardware-in-the-loop (HIL) testing use cases.

SimHIL is compatible with the third-party tools listed in Table 3. Hardware, firmware, and software compatibility of these tools should always be confirmed with your Spirent Federal representative prior to placing an order.

If the variant or tool you are interested in is not listed, please contact Spirent for further information.

Table 3. SimHIL Options

Option	Real-time HW supported	SW versions supported	Supported SIR
SimHIL for dSPACE	dSPACE SCALEXIO 2.0	dSPACE Release 2019-A dSPACE Release 2021-A dSPACE Release 2022-A dSPACE Release 2023-A	Up to 10 ms (100 Hz)
SimHIL for IPG	NI PXIe 8840 13.1	IPG CarMaker 8.1.2 (Windows) IPG CarMaker 9.1.2 (Windows) IPG CarMaker HIL 9.1.2 (NI RT Linux OS) IPG CarMaker 10.1 (NI RT Linux OS)	Up to 10 ms (100 Hz)
SimHIL for SCANeR		SCANeR Studio 1.7 SCANeR Studio 1.8 SCANeR Studio 1.9r65 SCANeR Studio 2021, 2022 and 2023	Up to 10 ms (100 Hz)

PNT Automation

PNT Xe supports automation via Spirent PNT Automation, a comprehensive test authoring and execution tool built for testers, developers, and automation teams. It addresses the needs of manual testers, automation specialists, and managers alike to improve the productivity of the entire test workflow.

PNT Automation enables multiple tests to be run without any external intervention while providing analysis and test report capabilities.

It is specifically designed for PNT testing and includes control software (based on SimREMOTE) to accurately achieve the interoperability between Spirent simulators and the device(s) under test (DUT). The DUTs are configured and controlled with PNT Automation using a dedicated user interface.

For additional information, please check MS3119.

STANDPOINT

PNT Xe is fully compatible with Spirent STANDPOINT, offering synchronization between the simulator and live-sky GNSS signals. It supports advanced testing scenarios such as spoofing, resilience assessments, and seamless transition between live and simulated environments. This integration allows users to conduct high-integrity tests with full control over signal conditions while leveraging real-world satellite data for enhanced realism.

For additional information, please check MS3121.

External Interference Simulator GSS7765

PNT Xe can be combined with Spirent's external interference simulator, the GSS7765, to provide a comprehensive solution for testing satellite navigation equipment in the presence of intentional or unintentional RF interference.

The GSS7765 supports an extremely broad range of interfering signal types, including Continuous Wave (CW), AM, and FM. (Pulsed signals are also available.) The interference simulator also supports noise generation with variable bandwidth.

Seamless integration with PNT Xe ensures full support for GNSS scenario execution, with coordinated control over interference signal content and dynamics.

For further technical details, refer to MS3055.

Connectivity

Table 4. Signal Generator Connectivity

Port	Type	Parameter
Main RF Port	Output	N-type coax female, 50 Ohm, VSWR <1.2:1 AC coupled ± 50 V DC, maximum reverse RF 30 dBm
High Level RF Port	Output	N-type coax female, 50 Ohm, VSWR <1.2:1 AC coupled ± 50 V DC, maximum reverse RF 30 dBm
External Frequency Standard	Input	BNC coax socket, 50 Ohm -5 to +10 dBm at 1 MHz, 5 MHz, 10 MHz
Internal Frequency Standard	Output	BNC coax socket, 50 Ohm 10.00 MHz at +5 dBm nominal
1PPS IN	Input	BNC coax socket, 50 ohm, TTL level compatible
1PPS OUT	Output	BNC coax socket, 50 Ohm, TTL level compatible
Trigger IN	Input	BNC coax socket, 50 ohm, TTL level compatible
Timer	Output	BNC coax socket, 50 ohm, TTL level compatible. User configurable

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Table 5. Internal Controller Connectivity

Interface	Type	Parameter
USB (x6)	I/O	Mouse, keyboard, and general file access (2 accessed from front + 4 on rear panel)
Ethernet (x1)	I/O	RJ-45 Ethernet interface standard. Used for general network access and available for remote control
Display Port	I/O	Video monitor port

Physical and Environmental Properties

Table 6. Physical and Environmental Properties

Part	Parameter	Value
Signal Generator	2U Chassis Dimensions (Height x Width x Depth)	H: 88.1mm
		W: 448.7mm (enclosure only)
		W: 482.6mm (including rack-mount ears)
		D: 495.5mm (enclosure only)
		D: 513mm (including front & rear ports)
	Typical Weight	<15kg (33lb) (configuration dependent)
	Operating Environment	0 to +50°C (32 to 122°F) (40-90% RH, non-condensing) Altitude restriction of 2000m
	Storage Environment	-40 to +60°C (-40 to 140°F) (20-90% RH, non-condensing)
	Electrical Power	100-240V 5A Max 50 to 60Hz

Accreditation and Compliance

Table 7. Safety and EMC Compliance

Compliance	Applicable Standard
Safety	Low Voltage Directive (LVD) 2014/35/EC IEC 62368-1:2014 (Second Edition) Audio/video, information and communication technology equipment. Safety requirements
EMC	EMC Directive 2014/30/EC EN 61326-1:2021 Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements
MET	MET Certification. Listing number E113897; MET Project Number 109752 UL 62368-1/CAN C22.2 CSA 62368-1, Second Edition: Audio/video, information and communication technology equipment. Safety requirements

System Calibration

PNT Xe is calibrated in accordance with ISO/IEC 17025 standards at the time of purchase. This calibration remains valid for up to 180 days in storage prior to initial receipt by the customer, provided the unit is stored under standard environmental conditions. The recalibration interval is recommended to be 12 months, starting from when the unit is first put into service. To maintain ISO/IEC 17025 accreditation, all recalibrations must be performed by Spirent Federal or an authorized ISO/IEC 17025-accredited laboratory.

NOTE:

Installation of an additional SDR card or performing calibration outside of an accredited Spirent facility will invalidate the accredited calibration. This includes customer-initiated use of the Auto Calibration Utility (where installed) and certain hardware upgrade procedures.

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Related Brochures, Data Sheets, and Specifications

Table 8. Related Product References

Related Product	Description	Datasheet / Specification
SimREMOTE	Simulator remote control additional options	MS3015
SimROUTE	Road-matched trajectory generation tool	MS3073
PNT Automation	Test orchestration and automation platform	MS3119
STANDPOINT	Live-sky synchronization solution	MS3121
SimMCODE	AES M-Code upgrade option	MS9018
GSS7765	External interference generator	MS3055

Environmental Social & Governance (ESG)

Spirent's Positioning Technology Business Unit has been committed to ESG good practice and improvement since achieving ISO14001:2015 Environmental Management System certification in 2004.

We take ESG seriously across all aspects of our business from sustainable buildings, sustainable product design to sustainable supply chain, manufacturing, and shipping/exports.

Many of Spirent's Test Solutions rely on physical test equipment used in situ by our customers. We are working to reduce the lifecycle impacts of our products and the environments they are used in through a range of ways:

- Designing for environment and end of life, including compliance with all legal requirements;
- Reducing the size, weight, noise, and power use of our products;
- Virtualization and the development of Test-as-a-Service via PNT Professional Services;
- Improving utilization and automation
- In-field servicing and upgrades.

We use formal sustainability metrics in the product development process.

For more specific information on how ESG applies to our PNT Test Solutions, please contact your Spirent Federal representative.

For more information visit, <https://corporate.spirent.com/sustainability>.

For More Information

For more information on any aspect of PNT Xe, please contact Spirent Federal.

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Why Spirent?

Across five decades Spirent has brought unrivaled power, control, and precision to positioning, navigation and timing (PNT) simulation. Spirent partners with the leading developers and integrators to consult and deliver on innovative solutions, using the highest quality hardware and the most flexible and intuitive software on the market.

Spirent delivers

- Simplified testing accelerates the innovation cycle and deployment of robust PNT systems
- Proven track record of being first-to-market with new signals and ICDs
- Unrivaled investment in customer-focused R&D
- World-leading expertise, redefining industry expectations
- Powerful, flexible, and customizable SDR technology for future-proofed test capabilities
- Signals built from first principles — giving reliable and precise truth data

About Spirent Positioning Technology

Spirent enables innovation and development in the GNSS and additional PNT technologies that are increasingly influencing our lives. Our clients promise superior performance to their customers. By providing comprehensive and tailored test and assurance solutions, Spirent assures that our clients fulfill that promise.

About Spirent Federal Systems

Spirent Federal Systems provides the world's leading PNT test solutions to the US Government and contractors to enable resilient PNT under any conditions and outpace evolving navigation warfare threats. As a US proxy company, Spirent Federal enhances Spirent's commercial offerings with classified and other sensitive military signal emulation capabilities.

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